

DOCUMENT RESUME

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IDENTIFIERS *Compressed Gas; *Liquefied Petroleum Gas

ABSTRACT

Part of a series of instructional outlines intended for use in a training program for firemen with no previous formal training, this curriculum guide discusses safety precautions for liquefied petroleum (LP) and compressed gas emergencies. During its twelve hours of instruction it covers (1) terminology; (2) the chemical composition of the gases; (3) domestic tanks; (4) delivery units; (5) motor fuel tanks; (6) cylinder filling and the problems associated with it; and (7) the steps in controlling LP gas fires. The booklet includes handouts diagramming the parts of delivery units, domestic and motor fuel tanks, valves, and fittings. Various references and training aids such as films and equipment are suggested. (ELG)

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FIRE SERVICE TRAINING:

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COMPRESSED GAS EMERGENCIES

PURPOSE

This course outline has but one purpose! To give the fire fighter the basic knowledge in order to safely cope with compressed gas emergencies. However, before any approach can be made to safety, it is essential that a thorough basic understanding be had of the product. Safety can be defined as knowing what to do and when to do it.

AIM

To gain a basic understanding in how to better handle the emergencies that arise out of the usage of compressed gases - namely LP Gas.

OUTLINE OF INSTRUCTION

12 Hours

I. Terms Used in Compressed Gases.

A. LP Gas - liquefied petroleum gas.

1. Combination of butane - iso-butane or propane, ethane, ethylene propene, butenes.

B. Expansion ratio - one liquid gallon expands to 270 times when released into atmosphere.

C. BTU - British Thermal Unit - measurement of heat.

D. Cylinder - container used in storing liquid LP Gas. Ranging in size for one pound hand-held cylinder upwards to bulk plant 18,000 - 20,000 or higher.

E. Limits of flammability - the proper mixture for supporting combustion:

Propane 2.37 to 9.50

Butane 1.86 to 8.46

F. Cubic foot - system of measurement for gas:

Propane - BTU per cubic foot at 60F 2520

Butane - BTU per cubic foot at 60F 3270

G. Safety valves - back flow check - excess flowcheck -
pressure relief valve - liquid service valve - POL valve.

II. Composition of Product that Fire Fighter Normally Deals With.

Mixture is 60 - 40

60 propane - 40 butane

LP Gas produced from natural is colorless, tasteless and odorless. LP Gas is non-toxic, however, in high concentrations of gas, there is usually a deficiency of oxygen. Liquid LP Gas is an effective refrigerant.

III. Domestic Tanks (Handout 1).

A. Location of different valves.

B. Sizes.

IV. LP Gas Delivery Units (Handout 2).

A. Location of valves.

B. Safety features.

V. Motor Fuel Tank Lay-out (Handout 3).

A. Valves.

B. Safety features.

VI. Cylinder Filling.

A. Source of trouble.

Over filling causes pressure build-up and relief valve to pop off discharging excess pressure - or gas. Containers with water capacity less than 200 pounds shall be charged

by weight. Exception: motor fuel tanks and portable containers. Law permits the weight of propane to be not greater than 42% of the water capacity in pounds. Example: 20 pound cylinder - water capacity is 42 pounds - 42% of 48 is 20 pounds. Water weighs 8.33 pounds per gallon - propane weighs 4.23 pounds per gallon - 5 gallons liquid approximate in each 20 pound cylinder or 1350 vapor or atmosphere gallons.

VII. Steps in Fire Ground Operations.

- A. Approach the fire from up-wind side.
- B. Keep all persons out of the area and at least 500 feet from the burning, or exposed tank.
- C. Try to shut off the source of the fuel. If the only valve which can control the fire is directly in the fire, work cautiously toward the seat of the fire in an effort to shut the fuel off. Do not extinguish the fire unless the fuel can be shut off.
- D. After shutting the fuel off, general mop-up can be done. Never shut the fuel off or extinguish the fire around safety relief valves. Cool the tank and the pressure will drop shutting the fire off.
- E. Three basic ways to cause tank failure.
 - 1. Never shoot a hole in the tank.
 - 2. Beware of any change of noise level on the safety relief valve.
 - 3. Flame contact on the metal cylinder within the air space that is not properly cooled by the firemen.

F. Summary.

LP Gas fires are control fires fought by fire fighters with full protective clothing.

Use water fog - nozzles discharging a minimum of 95 gallons per minute at 100 PSI - nozzle.

90 degree pattern for maximum protection to the men.

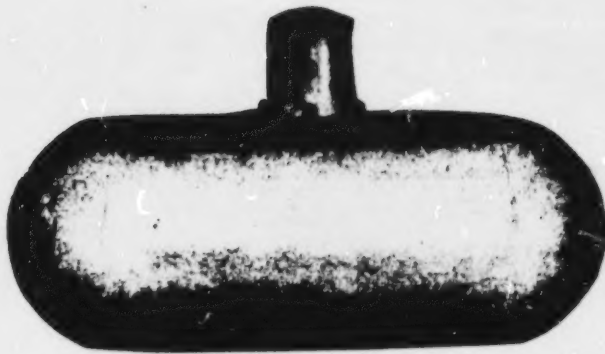
REFERENCES

1. LP Gas Safety - Pan American Insurance Group.
2. Group 2 Handout.
3. N.F.P.A. Inspection Manual.
4. A.I.A. Special Interest Bulletins 4, 20, 143.
5. Department of Labor - State of North Carolina - Supplementary Bulletin No. 9.

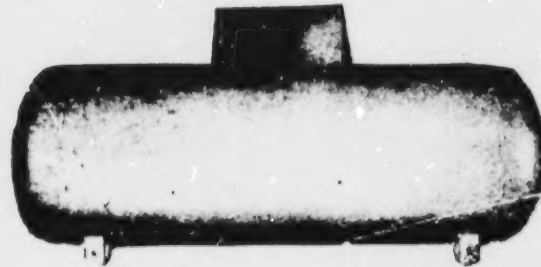
TRAINING AIDS

1. Handout.
2. Film - N.F.P.A. Handling LP Gas.
3. Valves.
4. LP Gas Rig.

DOMESTIC TANKS (Hand-out 1)

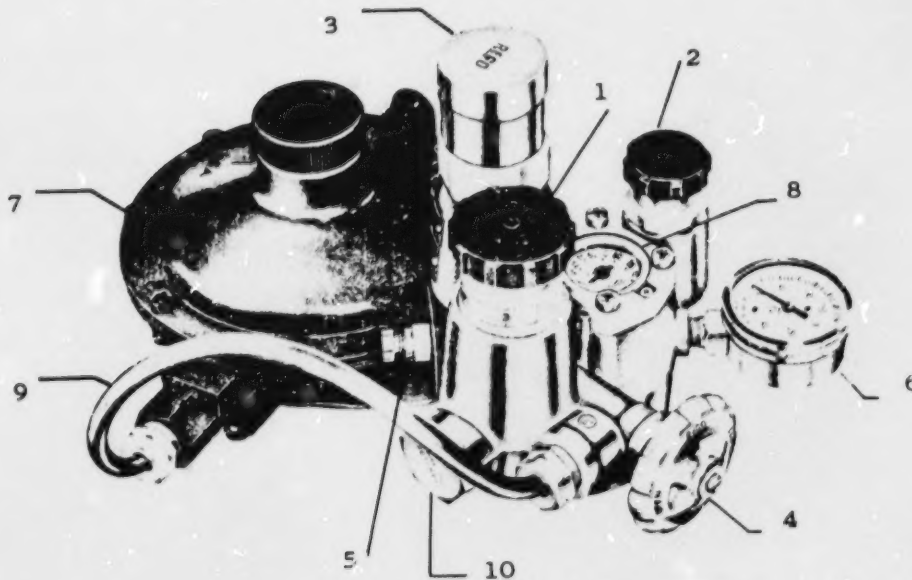


Under Ground



Above Ground

DOMESTIC MULTIVALVE ASSEMBLY

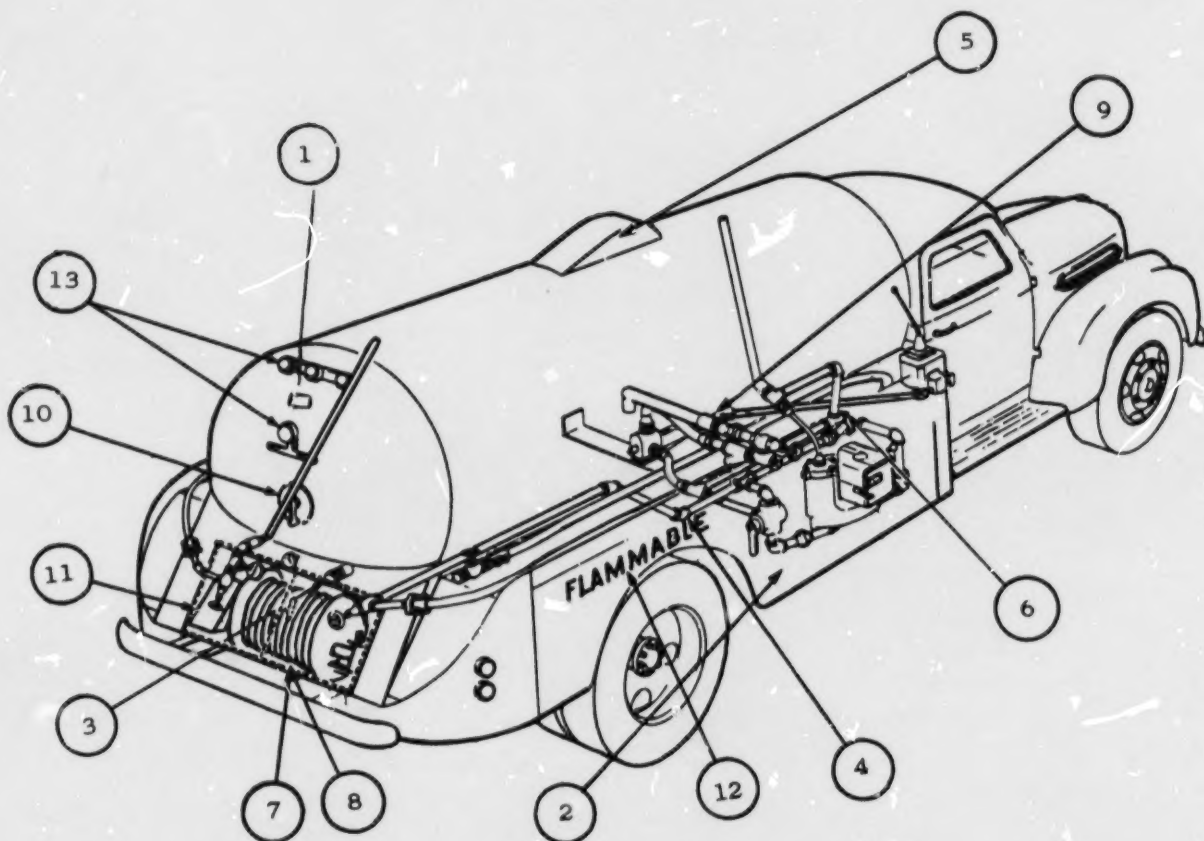


PARTS:

- | | |
|---|---|
| 1. Double Back Check Filler Valve | 6. Pressure Gauge |
| 2. Vapor Equalizing & Excess Flow Valve | 7. Regulator Assembly |
| 3. Safety Relief Valve | 8. Slip Tube of Float Type Liquid Level Gauge |
| 4. Service Line Shut-off Valve | 9. Pigtail |
| 5. Fixed Liquid Level Gauge | 10. Liquid Transfer Connection |

NOTE: Effort is being made in some states to require that Relief Valves on Domestic Aboveground Tanks be located outside the dome.

LPG DELIVERY UNIT (Hand-out 2)



PARTS:

- | | |
|---|---|
| 1. Name Plates | 7. Transfer Hoses Properly Protected During Transit |
| 2. Protection for Tank, Piping & Valves | 8. Hose in Good Condition & Periodically Checked |
| 3. Back Flow Check or Quick Closing Internal Valve Provided on Filling Connection | 9. Necessary Excess Flow Valves |
| 4. All Fittings Extra Heavy Duty | 10. Liquid Level Gauging Device |
| 5. Relief Valve | 11. Chock Blocks |
| 6. Pressure-actuated By-pass Installed if Pump is Other Than Constant Speed Centrifugal | 12. Truck Marked in Compliance With State & ICC Regulations |
| | 13. Required Reflectors & Tail Lights |

MOTOR FUEL TANK (Hand-out 3)

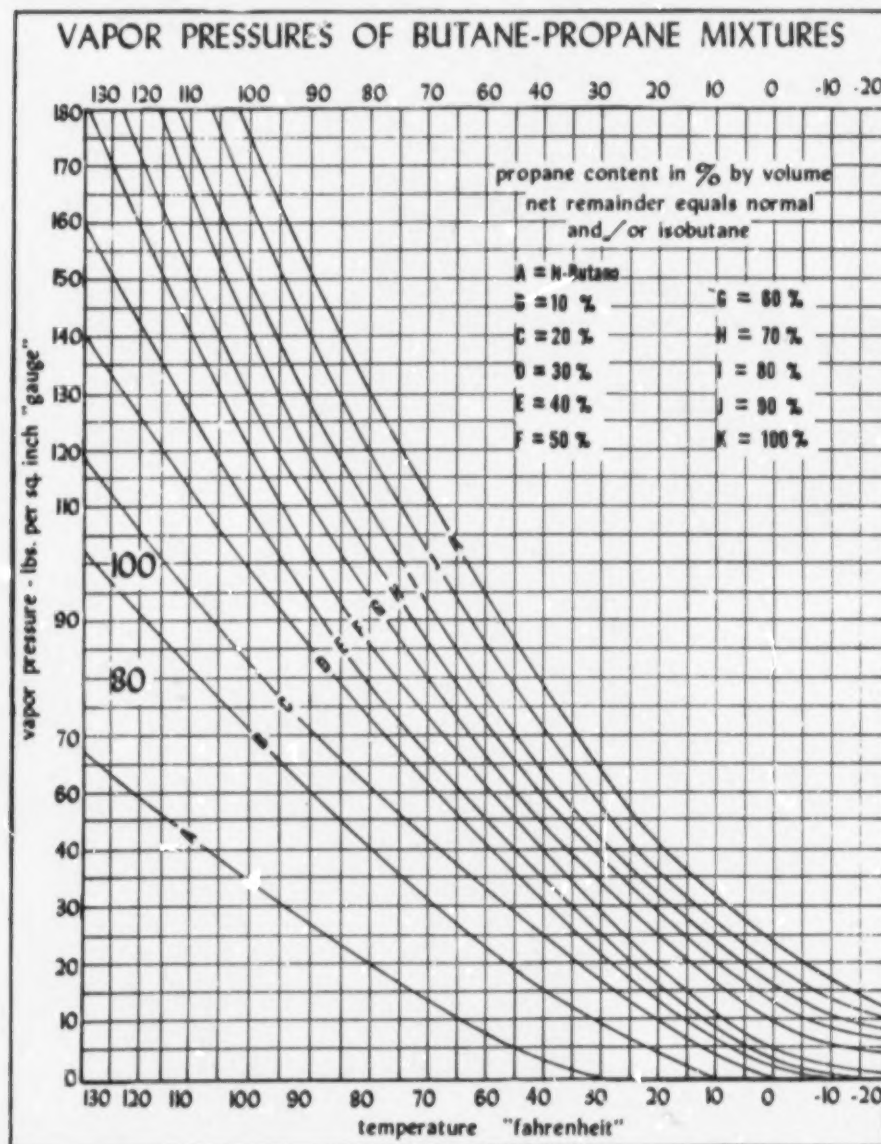


Safety Tips:

1. Before filling a private passenger automobile equipped with LP-Gas carburetion, ask all occupants to step out. Leave one or more doors open for ventilation. Remember, smoking is prohibited within 50 feet of the transfer.
2. Leave turtle shell open for at least five minutes after fuel transfer, to allow spillage to disburse.
3. It is not a safe practice to use cargo tanks as a source of motor fuel supply.
4. The use of fusible plugs or frangible discs is prohibited.
5. Relief valves on motor fuel tanks installed in the trunks of private passenger automobiles should be vented to the outside.
6. Relief valves on motor fuel tanks on trucks must be vented above the cab.
7. All radio equipment should be sealed off from the container space.

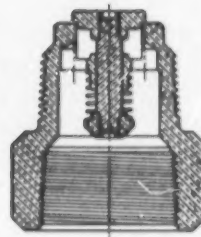
(The preceding information was taken from Handbook No. 4, United States Department of Interior, Bureau of Mines).

It can be seen from the foregoing table that propane is lighter, becomes a gas at a lower temperature, and has less heat value (BTU) per cubic foot than butane. Since propane boils at about 44° below zero, it supplies gas much more rapidly at the colder winter temperatures than butane, which boils at about 32° above zero. At the same temperature, the vapor pressure of propane is much lighter than that of butane. This is the reason for the greater use of propane in colder climates.

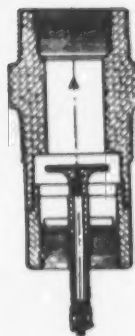


FUNDAMENTAL VALVES & FITTINGS

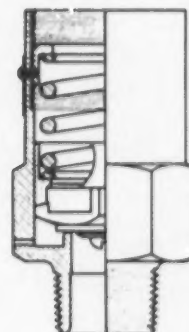
- Back Flow Check Valve, which always remains closed except when fuel flow from outside forces it open.

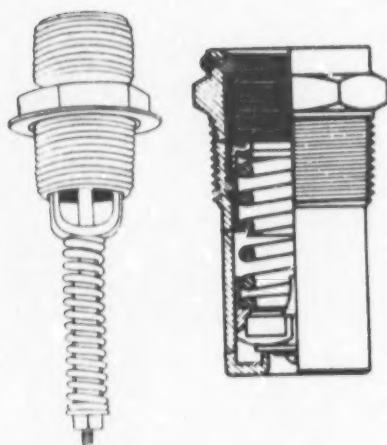


- Excess Flow Check Valve, which permits flow in either direction but closes automatically when outward flow exceeds safe rate.

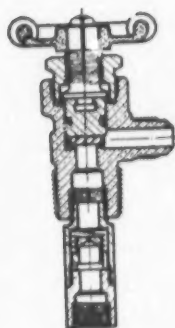


- Pressure Relief Valve, external type, held closed by coil spring unless tank pressure becomes higher than "working pressure."

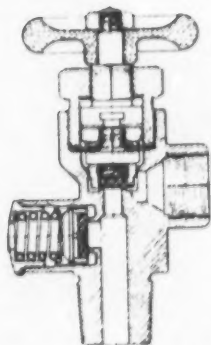




- Pressure Relief Valves, internal types. Accidental damage to portion outside tank does not affect closure.



- Liquid Service Valve with integral excess flow check valve, for customer bulk tanks and motor vehicle fuel tanks.



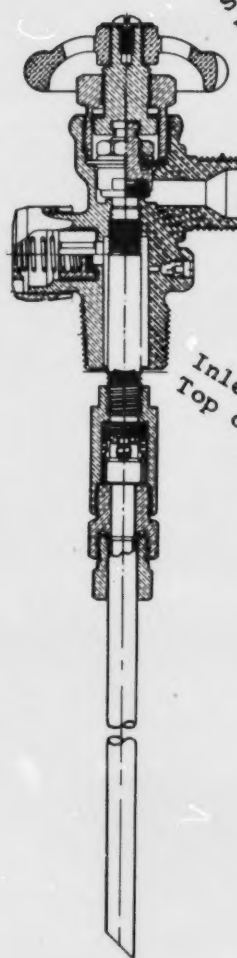
- PCL Valve with built-in pressure relief for vapor withdrawal from cylinders. Also comes with excess flow check valve and with extension tube for liquid withdrawal.

CYLINDER VALVE

for liquid withdrawal ICC Cylinders



Safety
Relief
Valve



Shut off
Hand Wheel

Outlet Threads for
Pigtail of Regulator
and Filling Connection
at Plant

Inlet Threads for
Top of Cylinder

